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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/603,341	06/25/2003	Matthew O'Donnell	UOM 0274 PUSP	2637
22045 7590 01/08/2008 BROOKS KUSHMAN P.C. 1000 TOWN CENTER TWENTY-SECOND FLOOR SOUTHFIELD, MI 48075				
EXAMINER				
SHAY, DAVID M				
ART UNIT		PAPER NUMBER		
3735				
MAIL DATE		DELIVERY MODE		
01/08/2008		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/603,341

**Applicant(s)**

O'DONNELL, MATTHEW

**Examiner**

david shay

**Art Unit**

3735

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on October 30, 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 2, 4-8, 12-15, 18-21, 23, 24, 27-29, 36, 40, 44 and 45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-8, 12-15, 18-21, 23, 24, 27-29, 36, 40, 44 and 45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 30, 2007 has been entered.

Applicant reminds the examiner that a radiation force is due to the absorption or reflection of an acoustic wave, and deduces from this that a substantially continuous radiation force can be exerted by applying a continuous acoustic wave to a microbubble. While the examiner concedes that the portion of the publication entitled "The Acoustic Bubble" supplied by applicant does appear to indicate that the term "radiation pressure" can be broad enough to include pressure from acoustic radiation and that such radiation pressure can be used to transmit some kind of force, the examiner has been unable to find any reference to "continuous radiation force" or "substantially continuous radiation force" therein. However, since the claims are to be given their broadest reasonable interpretation, and since even a pulsed source of radiation can be considered "substantially continuous" depending on the duty cycle thereof, the examiner withdraws the objection and rejection based on enablement issues concerning claims 5 and 28. However, applicant has not enablingly taught how to produce the entirety of the step recited in claim 20. The mention that the microbubble "operates as a high frequency, high precision acoustic source" in the originally filed disclosure does not provide the necessary teachings of the means by which to produce, control, and direct the shockwave so it "operates as a high frequency, high precision acoustic source". As an example, a disclosure reciting "the tin can being configured to act as an antigravity source" does not provide sufficient information to one

of ordinary skill in the art to enable one of ordinary skill in the art to configure a tin can to produce an antigravity field. Thus these arguments are not convincing, and the rejections have been maintained.

With regard to claims 7 and 8 et cetera, it is not the recitation of the terms micro-Newtons and nano-Newtons (or the numerical expression of the exact same concept as the prefixes), per se, but the range implied by use of the term “level” in conjunction with these recitations. For example, would a force of 5 GigaNewtons qualify as “a force in the micro-Newton level”, since a GigaNewton is merely  $10^{19} \times 10^{-6}$  Newtons? The amended phrases are still unclear for the same reason. While it is noted that applicant asserts that 1012 Newtons is not in the  $10^{-6}$  Newton level, the examiner must respectfully note first of all, that applicant’s remarks cannot take the place of evidence, and there is no evidence that the phrases in the claim must be construed to exclude values of gigaNewtons, and secondly, that terms of this nature have been held to be indefinite because the specification lacked some standard for measuring the degree intended (see MPEP 2173.05(b)(F)). With regard to claim 14, applicant “reminds” the examiner that “a microbubble with a diameter of less than 1 micron is a nanobubble”. The examiner must respectfully point out that, according to the source referenced by applicant, this is apparently not the definition of a nanobubble, since Microbubbles typically have diameters of the order of 1 to 2 microns, and are sometimes as small as a few hundred nanometers...” (see the penultimate sentence on page 59). Thus clearly, microbubbles may be substantially smaller than 1 micron. However, it is also noted that as the submitted publication does discuss the use of, and thus implicitly the production, of nanobubbles, it is clear that one of ordinary skill in the art would readily understand how to produce, recognize and use nanobubbles, as well as distinguish them from

microbubbles. Thus the indefiniteness rejection based on the use of these terms are also withdrawn.

With regard to the art rejection, applicant argues that LeClair teaches the formation of micro-jets brought about by the collapse of the bubbles, pointing to the disclosure thereof at column 4, lines 32-54. While this is noted, it does nothing to remove the disclosure at column 6, line 38 to column 9, line 14, as already pointed out by the examiner. This disclosure, which will be described in an exemplary fashion with respect to Figures 3a-3e, teaches that two bubbles are formed (elements 202 and 200 in Figure 3a and column 6, lines 42-44); these are formed “at approximately the same time” (column 6, lines 44-45); which then expand (column 6, lines 45-47); since the bubbles are formed by vaporizing fluid, as can be seen from the portion of LeClair reproduced in the instant response (see pages 8-9 thereof), the force from the pressure wave generated by the rapidly expanding bubble, being in a liquid, will be substantially completely transmitted to the adjacent bubble, and thereby displace it. Being as acoustic radiation is merely a pressure wave (see page 19 of applicant’s submission “The Acoustic Bubble”), the pressure wave generated by LeClair, is simply acoustic radiation. As applicant has pointed to no reason why the ordinary processes described by the physics of the situation, such as the acoustic radiation from one bubble displacing the other, would not operate in the method of LeClair, as it does in the method of applicant, these processes must be assumed to be present in LeClair as well. Since the bubbles survive subsequent to the expansion phase of the bubbles, as can be seen from the figures and the attendant disclosure, the claimed process reads on the this process.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim 20 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The originally filed disclosure is silent on the manner in which the "at least one laser pulse also creates at least one acoustic shock wave via LJOB wherein the at least one acoustic shock wave operates as a high frequency, high precision acoustic source".

Claims 3, 7, 8, and 11-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 is indefinite as the exact meaning of the term "force in the  $1 \times 10^{-6}$  Newton to  $1 \times 10^{-9}$  Newton level" is unclear. Claim 8 is indefinite as the exact meaning of the term "force in the  $1 \times 10^{-12}$  Newton to  $1 \times 10^{-15}$  Newton level" is unclear. Claim 11 is indefinite, because it is unclear what further limitation requiring that the "acoustic wave causes the microbubble to move ..." provides when claim 1, from which claim 11 depends, requires that the acoustic wave "displace a central portion of the microbubble".

Claims 1, 2, 4-8, 13-15, 18-21, 23, 24, 27-29, 36, 40, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over LeClair in combination with Siegel et al. LeClair teaches manipulating materials using microbubbles. Siegel et al teach controllably manipulating microbubbles with an acoustic field. It would have been obvious to the artisan of ordinary skill employ the acoustic energy directing of Siegel et al in the method of LeClair, since this would direct the bubbles, or to employ the jet forming method of LeClair in the method of Siegel et al,

since this would cause more effective removal of the thrombus, and in either case to employ a femtosecond laser pulse to generate the microbubble of LeClair, since this is not critical; is well within the skill of one having ordinary skill in the art; and provides no unexpected result, and would deposit the energy in the material quickly, thereby minimizing the escape of thermal energy into the surrounding medium, thus producing a device and method such as claimed.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeClair in combination with Siegel et al, as applied to claims 1, 2, 4-8, 13-15, 18-21, 23, 24, 27-29, 36, 40, 44, and 45 and further al in combination with Ozkan et al. Ozkan et al teaches a method of cell patterning. It would have been obvious to the artisan of ordinary skill to employ the combined microbubble method of LeClair and Siegel et al in the patterning of Ozkan et al since the combined method of LeClair and Siegel et al does not require that charges be induces on the items to be patterned, or to employ patterning in the combined method of LeClair and Siegel et al, since the combined method of LeClair and Siegel et al can be used for any purposes, as taught by LeClair, and in either case to measure the elasticity of the material, since this provides no unexpected result, and is well within the scope of one having ordinary skill in the art, thus producing a device and method such as claimed.

Applicant's arguments with respect to claims 1, 2, 4-8, 12-15, 18-21, 23, 24, 27-29, 36, 40, 44, and 45 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to david shay whose telephone number is (571) 272-4773. The examiner can normally be reached on Tuesday through Friday from 6:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Marmor, II, can be reached on Monday, Tuesday, Wednesday, Thursday, and Friday. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/david shay/

Primary Examiner, Art Unit 3735